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*Newtoni Opuscula*, gives it in the Latin which appeared in 1731, not for the first time: he says *Angli omnes Newtono tribuunt*. It appeared just after Newton's death, without the name of any editor, or any allusion to Newton's recent departure, purporting to be that popular treatise which Newton, at the beginning of the third book of the *Principia*, says he wrote, intending it to be the third book. It is very possible that some observant turn-penny might construct such a treatise as this from the third book, that it might be ready for publication the moment Newton could not disown it. It has been treated with singular silence: the name of the editor has never been given. Rigaud mentions it without a word: I cannot find it in Brewster's *Newton*, nor in the *Biographia Britannica*. There is no copy in the Catalogue of the Royal Society's Library, either in English or Latin, except in Castiglione. I am open to correction; but I think nothing from Newton's acknowledged works will prove—as laid down in the suspected work—that he took Numa's temple of Vesta, with a central fire, to be intended to symbolize the sun as the centre of our system, in the Copernican sense.

(*To be continued.*)

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*Report on the Fifth International Statistical Congress, held at Berlin, Sept. 6th to 12th, 1863. By SAMUEL BROWN, F.S.S., Vice-President of the Institute of Actuaries.*

FIVE meetings of the International Statistical Congress have now been held, and it cannot be denied, that, with the vast increase in commerce, and in the social relations of different countries, they continue to grow in interest and importance. The first Congress, which may be truly said to owe its origin to the exertions of, and was presided over by, that eminent writer and thinker, M. Quetelet, was held in Brussels, in 1853; the second in Paris, in 1855; the third in Vienna, in 1857; the fourth in London, in 1860. At the successful close of this last Congress, at which the lamented Prince Consort presided, and on the opening of which he delivered one of the most eloquent and philosophical discourses on the objects and advantages of statistical science which it has ever been our good fortune to hear, the place of meeting for the next Congress was debated. With the applause of the members present, the Rt. Hon. W. F. Cowper, Vice-President, being in the chair, suggested Berlin; and it was eventually left to the Committee of

Organization in England to arrange the place and time for the following assembly. Although fixed for Berlin, various difficulties occurred against its taking place within the period of two years as originally proposed, and it seemed probable even that political difficulties on the continent, and the reorganization of the official statistics of Prussia, might have deferred the meeting till 1864. It is in a great measure owing to the tact, the energy, and the abilities of Dr. Engel, the Director of the Royal Statistical Bureau of Prussia, that we are enabled to report the successful termination of another Congress at the same interval of time as between those of Vienna and London—namely, three years. A Preparatory Commission was nominated by His Excellency Count Eulenburg, the Minister of the Interior, in accordance with the recommendation of the “Central Commission of Statistics,” on the 5th March, 1863; and to this body was addressed, by Dr. Engel, a very admirable and lucid “*avant-projet*” of the various questions to be debated, and of the best method of subdividing them into sections so as to ensure the fullest discussion by the members who had specially made them their study. These questions consisted partly of those which had been proposed and were standing over from previous meetings, and partly of such as from recent circumstances had risen into importance for the public interest. The subdivisions were as follows, and they were adopted into the general programme with an able introduction to each by different authors. Some of these papers were translated into French, for the use of the foreign members; but a few, marked thus \*, are found only in the original German programme.

1st Section.—Questions of organization.

	Reporters.
1. Organization of the Congress . . .	Dr. Engel.
2. Organization of official statistics . . .	Prof. Dr. Gneist.
3. Organization of statistics of population (the Census) . . . . .	Dr. S. Neumann.
4. On the limits for the co-operation of the people in the Census . . . . .	
	Dr. Engel.

2nd Section.—Statistics of landed property.

*1. General introduction . . . . .	M. Bitter, Director in the Ministry of Finance.
2. Nature and extent of landed property . .	M. Gauss, Inspector of Surveys.
3. Distribution and changes in landed property	M. Schuhman, Privy Councillor.
4. Distribution of landed property in a poli- tical and social point of view . . . . .	Dr. Engel, do.

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| 5. Establishment of mortgage registers, and<br>their organization . . . . .     | } | President Dr. Lette.                   |
| *6. Purchase of charges on property . . . . .                                   |   |  |
| *7. The division of common rights, and the<br>reunion of the portions . . . . . | } | M. Gabler, Govern-<br>ment Councillor. |
| 8. Property consisting of buildings . . . . .                                   |   |  |
| 9. The changes, saleable value, and charges<br>of landed property . . . . .     | } | M. Poch-hammer,<br>Privy Councillor.   |
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|   |   | Dr. Engel.                             |
|   |   | Dr. Engel.                             |

*3rd Section.*—Prices and wages.—Goods traffic on railways.

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| 1. Prices and wages . . . . .                        | Dr. Engel.                  |
| 2. Statistics of goods traffic on railways . . . . . | M. Volz, Official<br>Chief. |

*4th Section.*—Health and mortality amongst the civil and military population.

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| 1. Vitality and mortality of the civil population . . . . .                      | Dr. Engel.   |
| 2. Statistics of recruiting . . . . .  | Prof. Dr. Virchow.                                       |
| 3. Sanitary condition of armies . . . . .  | Do.  |
| 4. Supplementary proposition respecting the<br>statistics of hospitals . . . . . | } Dr. S. Neumann, Dr.<br>Wilms, and Prof.<br>Dr. Hirsch. |
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*5th Section.*—*a*, Provident Institutions; *b*, assurances.

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| <i>a.</i> 1. Statistics of savings banks . . . . .                          | Dr. O. Hubner.                                    |
| 2. Statistics of associations for mutual aid . . . . .                      | Messrs. Schulze-<br>Delitzsch and Ben-<br>semann. |
| 3. Statistics of associations for mutual in-<br>struction . . . . .         | } Drs. Engel and<br>Steinert.                     |
| <i>b.</i> 1. Assurances in general . . . . .                                |   |
| 2. Assurances on human life . . . . .                                       | M. W. Lazarus (Ham-<br>burg).                     |
|   | Dr. Amelung (Stettin)<br>and W. Lazarus.          |
| *3. Tontine assurances . . . . .  | M. Tiede, Finance<br>Councillor.                  |
| *4. Mutual aid funds (for sickness, super-<br>annuation, orphans) . . . . . | } M. A. Heym (Leip-<br>zig).                      |
| *5. Fire insurance.   |   |
| 6. Hail insurance . . . . .   | M. A. Herz.                                       |
| 7. Insurance of goods traffic . . . . .                                     | M. W. Lazarus.                                    |
| 8. Cattle insurance . . . . .   | MM. Warnecke, Knie-<br>busch and Spinola.         |
| *9. Mortgage insurance . . . . .  | M. O. Hubner.                                     |

*6th Section.*—Unity of money, weights and measures, as affording most important facilities in comparative statistics.

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| 1. The introduction of the metrical system as<br>an international system of measures . . . . . | } | Prof. Dr. Magnus.              |
| 2. Separate opinion of . . . . .   |   |                                |
|  |   | M. Hagen, Privy<br>Councillor. |

Such are the broad outlines of the questions before the Congress. It must be admitted that they form important subjects for discussion, and the manner in which they were disposed of will best appear in a brief history of the proceedings of each day.

On the 4th and 5th Sept. preliminary meetings were held, which were confined to the official delegates of the different Governments, with the view of coming to some agreement as to the first and very important proposition, by Dr. Engel, of giving to the Congress a permanent character. Dr. Engel, Dr. Farr, Dr. Berg, M. Legoyt, M. Visschers, Dr. Ficker, and Dr. Schubert, were named a Committee to report thereon.

On the 6th Sept. the general sittings of the Congress commenced, at 11 o'clock, in the Herren-haus, or House of Lords, and, after allowing an hour's time for the mutual greetings of the members, many of whom met for the first time after three years' absence, His Excellency Count Eulenburg, Minister of the Interior, in a few but emphatic words, welcomed the assembly in the name of the Prussian Government. On the motion of the Marquis d'Avila, of Portugal, the Preparatory Commission—His Excellency Count Eulenburg, Minister of the Interior, being President—were unanimously elected to continue their functions for the Congress; and, on the proposition of Dr. Engel, the foreign vice-presidents were elected. The secretaries chosen for the German language were Assessor Böckh and Dr. Schwabe; for the French, M. von Boucher and Professor Reymond; and for English, Mr. Hammick. Dr. Engel, after explaining the difficulties under which he had laboured in the preparation of the programme, and which it was felt by all present could only have been overcome by the most laborious and indefatigable attention, announced that, up to this time, 283 native and 89 foreign members had given in their names; but on the Friday following the numbers had increased to 356 Prussian and 126 foreign members. Count Eulenburg concluded the meeting by informing the members that His Majesty the King had expressed a wish to give them welcome at the palace next day. The members comprising the different sections then retired, with the view of electing their vice-presidents and secretaries, so as to commence business on the following morning.

On the following day, the 7th Sept., His Excellency Count Eulenburg formally opened the Congress with an address, in which he drew attention to the early history of vital statistics, commencing with Halley's well-known table of mortality, deduced from the deaths in Breslau, the capital of Silesia, so far back as

1689 to 1691; and "*Die Gottliche Ordnung*," by Field-Marshal Süssmilch, which appeared in Berlin in 1742. He then traced the progress of Prussian statistics from 1683, when the Great Elector required the returns of the births, deaths and marriages, of several towns in Prussia, whilst so early as 1685 an annual detailed report of the progress of the people in all parts of the Prussian dominions was prepared for him. About 60 years ago His Majesty Friedrich Wilhelm III. laid the foundation of the present Royal Statistical Bureau. He then touched upon the principal subjects treated of in the programme; and concluded by reminding the members that their labours would not be in vain, and that the seed they were sowing would not fall on unfertile ground, but would bear fruit, if not for the present, yet in the next generation. Dr. von Hermann, of Bavaria, returned thanks in the name of the assembly for this able address, and for the honourable reception offered to the members by the Prussian Government.

On the suggestion of Dr. Engel, a few touching words were said by Dr. Farr on the great loss which statistical science, and this Congress in particular, had suffered by the loss since the last meeting, at which he had so ably presided, of the illustrious Prince Consort, "whose inaugural address," Dr. Farr says, "appears in the publication, by command of the Queen, as the last that was delivered by a great man, and it expressed the justest appreciation of your labours, which it connected with the loftiest principles of philosophy and directed to the noblest end—the good of the people of all nations." M. Quetelet, in early days the tutor of that great Prince, and honoured with his friendship, begged to add his heartfelt sympathy with the regret so feelingly expressed on behalf of the Congress by Dr. Farr. The great services of Lord Herbert, too early lost to his country, were also alluded to by Dr. Farr, and those of Professor Akersdijk of Holland, who had laboured so assiduously in the early meetings of the Congress, received an eloquent tribute from M. Visschers.

His Majesty the King of Prussia afterwards received the members of the Congress in the Palace at Berlin, speaking most graciously with many, who were introduced by His Excellency Count Eulenburg and Dr. Engel, and concluding by a brief address of welcome, first in German and afterwards in French. His Majesty said—

"When your Congress met the last time in London, you resolved to choose Berlin for the next place of reassembling. My Government was not slow to applaud this resolution, and it is with real satisfaction that I receive you in my residence. My Minister of the Interior has recently

informed you, that nearly two centuries ago, my ancestors, struck with the value of statistics, gave particular attention to the science—a heritage which I have adopted by conviction. The science which you cultivate, Gentlemen, is of the highest importance; and being essentially practical, has on that very account peculiar claims on the support of every Government. The questions which you are about to discuss are numerous and important, and will demand for their solution all your skill and far-known intelligence. I shall follow your labours with peculiar interest, and it will be with real satisfaction that I shall learn that they will tend, as assuredly they will, to the good of Prussia.”

M. Quetelet expressed, on behalf of the Congress, their sense of the honour and of the interest which the King took in their labours.

The following days were occupied, from 9 till 12 o'clock, by discussions on the parts of the programme in the different sections, and in the general meetings, at 1 to 4 o'clock, by the hearing of the very valuable reports on the progress of statistics in different countries, presented by the official foreign delegates. It would be impossible to reproduce here, even in brief, these very admirable summaries; containing, as they do, the latest accounts from official sources of the progress of statistics in every country of Europe and America, and of the great improvements which are daily being effected in the mode of collecting and publishing Government records. The uniformity which is gradually being introduced into them, whether on the subjects of population, commerce, law, internal communications, &c., is chiefly owing, within the last ten years, to these Statistical Congresses. The reports alluded to will, no doubt, be published in extenso; but, in the meantime, I can do little more than enumerate some of the more important with their authors. They were in most cases accompanied by presentation to the Congress of a very valuable collection of statistical official documents.

On the statistics of Portugal. By the Marquis d'Avila.

„ „ of Great Britain. By Dr. Farr (especially relating to the Census and the mortality in the army).

Statistics of the Island of Cuba. By Ramon de la Sagra; read by the the Count de Ripalda.

Statistics of Wurtemberg. By M. Riecke, Finance Councillor.

„ Russia. By M. de Szémenow.

„ Saxe Cobourg Gotha and Saxe Meiningen. By M. G. Hopf, Finance Councillor.

Statistics of Servia. By M. Jackschitch (of Belgrade).

Statistics published by the Board of Trade in Great Britain. By Mr. Valpy; and Mr. Hammick gave a report on the organization of the Poor-Law Unions in England in connection with manufacturing distress.

Statistics of Switzerland. By M. Stössel.

„ Austria. By Dr. Ficker.

„ the gold-fields of North America. By Mr. Samuel Ruggles,  
who also proposed a commission to inquire into the effect of the  
recent discoveries of gold on prices.

And several others, which were in print, relating to Italy (by M. Maestro), Sweden (by Dr. Berg), Denmark (by Prof. Aschehoug), the Grand Duchies of Hesse, Oldenbourg, &c. &c.

It is understood that the reports of the delegates are to be printed and bound up together, in a few weeks, in a separate volume.

To proceed, however, to the reports of the different sections and the resolutions adopted thereon by the general Congress, the organization of the Congress, the chief question in the 1st section, led, as might be supposed, to a very animated discussion. The proposition was to alter the existing constitution of the Congress, and to assimilate it in a great measure to the Association for the Promotion of Social Science, the British Association, and similar bodies having honorary, ordinary, corporate and annual members, with different rates of subscriptions from each, and a fixed executive. At present the Congress is called at the invitation of different Governments, the choice of the acceptance of which is, as a rule, left to the executive committee of the last Congress. The foreign members are, for the most part, delegates from their respective Governments, having therefore some influence in carrying out, or causing to be carried out, the resolutions of the Congress in the Government departments to which the statistics severally relate. A few other members, who have specially studied some of the subjects submitted for discussion, and whose opinions as that of practical and unprejudiced men may be considered to have weight in a public meeting, have generally been included amongst the foreign invitations, whilst in the country where the Congress is held, a very large number of statisticians in every branch, as we may remember was the case in this country in 1860, have given to the Government on these occasions the benefit of their peculiar studies or experience. To deprive these Congresses therefore of their Government character would, in my opinion, tend very largely to diminish their utility, for it is evident that the comparative statistics of countries as to population, commerce, industry, &c., can only be collected under the authority of each Government, and at the national charge. A private association, however much it may be supported and encouraged by the Government, could not be looked upon as having the same influence as their own delegates



specially deputed to consult with others, having similar authority to urge, upon their return, the carrying into effect the resolutions so carefully arrived at. On the other hand, the impulse that is given to improvement in statistical methods by the meeting of the Congress is, in a great measure, lost in the interval of two or three years for want of some central commission to see its deliberate conclusions carried out, to keep up the friendly intercourse of the official members, to exchange on some definite plan official publications, so that the improvements in one country may benefit all, and to record in some journal, accessible to the members in all countries, the suggestions which even the experience gained in the process of carrying out important changes may frequently afford. However, these and other difficulties, it was no doubt felt, required more time for consideration. The report of the section on this subject was read in German by Dr. Ficker, in French by M. Visschers. The conclusions were—(1) to defer the discussion of the subject till the next Congress; (2) to nominate an International Commission, charged with the duty of examining any propositions made thereon. After another lively discussion, in which the Marquis d'Avila, Dr. Varrentrapp, Dr. Levi, M. von Buschen, Dr. Farr, Dr. Engel, Dr. Baumhauer, M. Legoyt and others, took part, some being for referring it back to the section for another decision; the opinion of the section was at length adopted. On the next day the International Commission was named, consisting of—

Dr. Schubert	.	.	.	for Prussia.
Dr. Ficker	.	.	.	for Austria.
Dr. Farr	.	.	.	for Great Britain.
M. Legoyt	.	.	.	for France.
M. de Szémenow	.	.	.	for Russia.
Dr. Berg	.	.	.	for Sweden.
M. Visschers	.	.	.	for Belgium.

The second question of the same section met with more favour, viz., to recommend the establishment of a Central Commission of Statistics in every country. There can be no doubt that a great amount of labour would be saved, if all Government statistics could be collected on some definite plan, and with reference to other interests as well as the one which specially dictated the inquiry. The mere recollection of the vast amount of statistical materials buried in our Blue Books, overwhelms the memory, though no one who has had occasion to consult some of these records can fail to be struck with the valuable facts, too often thrown away and forgotten, after being collected and printed at such cost to the nation. Without intending the least reflection on the publication of the com-

mercial, legal, and population statistics, so elaborately and carefully compiled, it cannot be doubted that greater simplicity and clearness, in many points, would result from the chiefs of each department being constituted into one central board, under a responsible and able statistical minister. From the enormous increase of trade, the effects of emigration, the growth of colonies, the experiments in prison discipline and punishments, the fluctuations in manufacturing industry, the gold discoveries and their effects on prices, there is no country in which a central statistical authority is more needed or would be more welcomed than in this. Austria and Spain have lately adopted the system. Many countries are in advance of us in this very important question.

Another very useful proposition, on the motion of Professor Schubert, was also carried—that a copy of all Government statistical publications should be sent to the public libraries of the Universities and learned bodies in Europe. Considering the advantages that would result by the exchange of valuable official documents, and the small expense to a country of printing the extra numbers of copies required for this kind of distribution, so far as concerns papers of international interest, the resolution must be highly desirable to carry into effect.

The question of the census, and of the best mode of obtaining the co-operation of the people in taking it, was also debated in this section. The able articles in the programme point out the various difficulties of getting full replies to all the questions which should be asked, and suggest means of overcoming them. Dr. Engel strongly advises the formation of Statistical Societies, with branches in the provinces, so as to excite a local and personal interest in aid of official inquiries. The resolution of the Congress went to the effect, that it was not only desirable to obtain the forms filled up by the heads of families, but wherever the education of the people was sufficiently advanced to render the success of the plan probable, their co-operation should be sought in examining and correcting the returns, either as acting for the census officials, or as members of local committees.

The statistics of landed property, and change of ownership, afforded abundant materials for discussion in the 2nd section, which, together with surveys, productions, taxation, cultivation, buildings thereon, and risks attaching to them, mortgages and transfers of title, gave rise to several most able papers in the *avant-projet* and in the programme, by Dr. Engel, Gauss, and others. They occupy 6 pages of the former, and 32 pages of the latter; and it is impos-

sible to compress the multiplicity of subjects, and the reflections they give rise to, within any reasonable bounds, for the purpose of this paper. They led to resolutions—promising no slight amount of labour for the Organization Committee of the next Congress—to the effect, that the different Governments should furnish any information and schedules they may have collected, as to the distribution and changes in landed property; that they should afford to this Commission the means of preparing the existing statistics thereof for each country; that they should send in forms deemed suitable for collecting these statistics, with special reference to the legislation of the country on this subject; and lastly, that the Organization Commission should, by aid of these documents, prepare forms suitable for the collection of this class of statistics in the different civilized countries.

To the 3rd section was referred the very important question of prices and wages. In the "*avant-projet*," Dr. Engel draws attention to the vast variety of questions which would be treated of under this head, according to the propositions submitted to the Statistical Congress in London, many of which, he considers, refer rather to the history of the subject, and to bear the character of discussions in political economy than to be confined to the limits of statistics. It would be almost impossible to gather information as to the prices of all kinds of merchandise, and of every diversity of labour which is paid for. Yet, as the quantities and relative values of labour, and the commodities which it purchases, are essentials to a clear understanding of the condition and internal prosperity of any nation, it becomes of importance to obtain, at any rate, the statistics of the principal subdivisions of the subject. Dr. Engel, in the programme, classifies them in such a manner as to include all kinds of labour and production, the object of which is to supply—

1. Physical or material wants.
2. Intellectual and moral wants.
3. Social and political wants.

Under the first are comprised, food, clothing, fire, light; under the second, education, public worship, recreations, provision for support in old age; and in the third, means of labour, commerce, and transfer of the results of labour, and protection of person and property against enemies at home or abroad, and, to a certain extent, against natural loss.

Under each of these heads, it was proposed to obtain the price,

or cost to the public, of the principal articles, as well as of wages and salaries, in every manufacture, trade, and profession.

The resolutions finally submitted to the Congress by the Provisional Commission were, however, much more limited:—

1. That the Congress should confine itself to the statistics of prices and wages, and not extend the inquiry to their history.
2. The statistics of prices, under certain heads enumerated, including food, clothing, lodging, public instruction, health, and old age assurance, natural capital (such as land, &c.), water and steam power, the principal metals, and of capital and credit, to be obtained from the public quotations on exchanges.
3. The statistics of salaries may, in the first instance, be deduced from the accounts of the Railway Companies. (In illustration of this, an interesting table is given of the number of persons employed in each department on the German railways, for the years 1850 and 1860, with the average salary in each; proving that, on an average of all the branches, the salaries have increased 20 per cent. in the 10 years.)
4. It was recommended to ascertain the price of labour on the different exchanges. M. Maurice Block suggests, that the salaries of employés in hospitals might be added. Similar statistics in many other public establishments might be compared, such as the great Steamboat Companies, Docks, &c.

Two other resolutions were passed, as to prices of articles, in reference to weight as well as measure, and as to a general rule, to give in all cases the quantities from which the average price was obtained.

In this section, a very interesting notice was submitted, by M. Volz, on the goods traffic on railways. The subject had been treated both in the Paris and London Congresses—in the latter with an able Report from Captain Galton. Dr. Engel quotes various other papers, recently written in Germany, and concludes, that it is of great consequence to keep a regular register of the goods traffic on railways, classifying them under some definite heads, and especially noting the direction of the traffic, and whether the goods are conveyed the entire length of the line, or only part of it. The great difficulty (if these statistics are to indicate the relative character and importance of the trade of certain districts or countries) is, to

avoid the frequent enumeration of the same package, by its passing over more than one line of railway, and being inserted anew in each statement. The resolutions adopted were intended to correct these errors, by requiring the facts as to transport of goods between the two extremes of a line, whether to be sent to a foreign country, or from abroad, inland, or passing entirely over and off the line. It is evident that the same statistics should be simultaneously collected from canals and roads, or other means of conveyance to and fro. It is also important that attention should be given to the correction of the statistics of commerce between different countries, as the greatest discrepancies will be found by any one who examines the published tables. For instance, the sum of the exports and imports between France and Great Britain for the same period, in a particular case, quoted by Mr. Messenger, differs by no less than £15,356,000 — being, as stated by the French returns, about £37,870,000; and by the English returns, £22,514,000.

The 4th section carried on the discussions of subjects which had already received great attention in the London Congress, and on which most valuable papers were read from Drs. Farr, Sutherland, Bryson, Balfour, Bromley, Mr. Hodge, and last, not least in fame, from Miss Florence Nightingale. The health and mortality of the civil, compared with the military and naval populations, statistics of hospitals, of schools, of Sick Funds and Benevolent Societies, of Assurance and Provident Institutions, present a mass of subjects of never-failing, or rather always-growing, interest. But at the Berlin Congress the attention was confined to four excellent papers:—

The vitality and mortality of the civil population. By Dr. Engel.  
 Statistics of recruiting, and on the sanitary condition of armies. By Dr. Virchow.  
 And of hospitals. By Drs. Neumann, Wilms and Hirsch.

The periods of recruiting in countries where men born in definite years are called out, allow of a variety of observations as to the existing state of health, and physical qualities or defects, and even of occupation—causes of rejection throwing great light on the average vital condition of a population at an age when men are supposed to be in their prime of health and strength. These inquiries also form a valuable preliminary to the actual observations on the health and mortality or cause of dismissal from the army subsequently, on which very minute monthly schedules were agreed to as a recommendation from the Congress.

To the 4th section was confided the discussion of subjects more

peculiarly interesting to the members of the Institute of Actuaries. They are divided into two parts :—

1. Provident associations.
2. Assurances in general.

Under each of these heads some very excellent papers were prepared for the programme by men of great ability, well known to us by fame, whilst Dr. Engel's notice, which occupies 20 pages in the *avant projet*, deserves translation for its suggestive character in relation to the social condition of the working and other classes, whose incomes are uncertain, the causes of their distress and prosperity, and the advantages of Societies for self-help of various kinds. As in England alone there are more than 20,000 Friendly Societies, besides Savings Banks and Societies for mutual aid; in Prussia, besides miner's funds, more than 4,000 such societies, of which 2,000 have a total of 156,000 members; and in France, Belgium, Austria, and in other countries, well represented at the Congress, vast numbers of these useful institutions, an interest was given to this discussion, which was still more felt under the second division of the subject. A very large number of the Managers of Assurance Companies—Fire, Life, Marine, and, indeed, for all other branches—were assembled from all parts of Germany and from foreign countries, and it was soon found necessary to form several sub-committees to consider the separate questions.

The papers in the programme were as follows :—

*a.* Provident Institutions—

1. Statistics of Banks. By Dr. O. Hubner.
2. „ of Self-help Economic Societies. MM. Schulze Delitzsch, and Bensemann.
3. „ of Associations for the augmentation of the intellectual capital of the members—*i.e.*, mutual instruction, &c., like Mechanics' Institutes. Drs. Engel and Steinert.

Under *b*, assurances in general—

1. Assurances in general. By M. W. Lazarus (Hamburg).
2. „ on human life. Dr. Amelung and W. Lazarus.
6. „ against hail. M. A. Herz.
7. „ of goods in conveyance. M. W. Lazarus.
8. „ of cattle. Drs. Warnecke, Kniebusch, and Spinola.

These were all translated into French, but some others were printed only in the original German, there not being time to translate them. They related to—

3. Tontine assurances. M. Tiede.
4. Sick, Superannuation, and Orphan Funds. Dr. K. Heym.
5. Fire insurances. M. W. Lazarus. (This paper was not translated, as the managers of the more important Companies wished to confer together before settling the terms of the resolutions.)
9. Assurances of law titles, mortgages, &c. Dr. O. Hubner.

This section met under the presidency of Herr Geh. Regierungs Rath Jacobi, the Government Referee for Assurance Companies in Prussia, and when the questions, forms of schedule, &c., had been debated and settled in the different sub-committees, Mr. Hopf, Manager of the Life Assurance Bank of Gotha, was elected to draw up the report for the whole section, in order to present it to the Congress. In this he treated, with great ability generally, of the objects and advantages of assurances, and especially of the valuable statistics the Companies possess and can yield for the public benefit, whilst expecting in return such information as it is in the power of Government to obtain from the people, so as to increase the safety and solidity of these useful institutions.

The resolutions adopted thereon were to the following effect:—

#### 1. ASSURANCES IN GENERAL.—*General Resolutions.*

“1. Assurances requiring for their thorough development the aid of statistics, and their great importance justifying every assistance which can be afforded them, the International Statistical Congress resolves—That it is desirable to take into consideration, in the statistical returns, the requirements of assurances, and especially recommends a regular return of particulars desired by the various Assurance Offices, in so far as such return shall appear practicable to the Congress.

“2. Whereas the Assurance Offices are especially capable of furnishing statistics coming within their province; and whereas the return, collection, and publication of these statistics, may aid considerably the solution of important questions raised by science, by the administration of the State, and by the Assurance Offices themselves, the Congress recommends the return of these materials, but without exercising any compulsion on the Assurance Offices. The following principal heads may be enumerated as those which science has a right to demand from the Assurance Offices:—The nature of the Society; its floating capital; the nature of its business; its scope of business; with regard to its extent, quantity, and income.

“3. The International Statistical Congress resolves, that it is necessary to employ men specially appointed by each of the Assurance Offices, and mathematicians, in collecting and arranging the aforesaid statistical materials.

#### A.—*Life Assurances.*

“I. Whereas the organization of assurances particularly requires the aid of statistics for its complete development, and its economical importance justifying every assistance that can be given to it, the International Statistical Congress resolves that it is desirable to take into consideration the

requirements of the Societies in the statistical returns, and supports the claims of Life assurance by resolving that it is necessary that there should be—

“A. Made every five years, at least, returns showing the number of persons living in the parishes, districts, provinces and countries—or according to other geographical limits; paying special attention to the age by the year of birth, and up to two years by the month of birth (no other classification necessary), but not in classes. The sex should be indicated.

“B. Returns made at the end of each year, according to the parishes, districts, provinces and countries, or other geographical limits, showing—

“1. The number of persons who, in the course of the year, have entered into the population: *a*, born alive, mentioning the sex; *b*, immigrated, with the classification of age (as under A) and sex.

“2. The number of persons who have left the population: *a*, dead, excepting those still-born, the classification of age (as under A), sex, and cause of death; *b*, emigrated, with the classification of age (as under A), and sex.

“It is desirable that information should be furnished periodically, concerning—

“C. The rise and fluctuation of the rate of interest in the different States, more particularly upon the various investments of capital and for mortgage, deposits, and bills of exchange.

“D. For each division indicated under A and B, concerning—*a*, their civil position; *b*, their profession, trade, or occupation; *c*, their invaliding, according to cause, degree, and results.

“II. Whereas the Assurance Offices are well able, in the course of their business, to obtain statistical communications, and whereas published summaries of this statistical information will have a great influence in the solution of important questions in science, in the administration, and in the conduct of the Insurance Offices, the International Statistical Congress recommends that statements should be published, every five years at least—

“a. Of the Life Assurance Societies and the Sick and Invalid Funds.

“A. On the number of persons assured, paying especial attention to the age, proved by the year of birth, and up to the age of two years by the month of birth (*i. e.*, not classified in several lists of ages). The sex must be stated.

“B. Of the number of persons in each year of the interval since the last publication—1, who were assured, with the difference of age (as under A) and sex; 2, whose assurances terminated either (*a*) by death, with the classification of age (as under A) sex, and cause of death; (*b*) or other causes, with the classification of age (as under A) and sex.

“b. *Sick Funds*, specifying—

“C. The number of persons who have had medical attendance during illness, with the classification of age (as under A), and sex: *a*, of the illnesses only; *b*, of their duration; *c*, of the months in which the persons became ill; *d*, of their recovery.

“c. *Assurance Societies*, against accidents:—

“D. The number of persons who have met with accidents during the year, specifying causes and effects, with the classification of age (as under A) and sex.



“d. *Invalid Societies*:—

“E. The number of persons who have become invalided during the year, with classification of age (as under A) and sex.

“2. That periodical publications shall be made by the institutions in question—

“F. On the rate of interest reached in the different States, on the different capitals.

“G. For each distinct class assured mentioned under A and B: *a*, the civil condition; *b*, profession and occupation; *c*, place of abode.

“H. On the mortality and infirmity of persons who have been treated as exceptional lives and assured at a higher rate, giving the cause of the irregularity (*i.e.*, predisposition to a certain disease, and what stage of sickness; and occupations which place life in danger, the risk of war, sea voyages, residence in unhealthy climates), with regard to the year of birth (as under A) and sex.

“3. That every year the Life Assurance Offices should publish statements concerning—*a*, the number of persons, capital, income, classified according to the assurance tables, thus:—I. At decease: A, one life—*a*, whole life; *b*, temporary; *c*, deferred; B, joint lives. II. Survivorship: *a*, immediate life annuities; *b*, capital or deferred annuities. III. Other kinds, viz.: 1, assured at the commencement of the year; 2, new assurances in the year; 3, assurances expired—*a*, by death; *b*, by redemption; *c*, by expiration at the time assured for.

“A. On the receipts, divided into—*a*, premiums on old assurances continued; *b*, premiums on new assurances; *c*, capital; *d*, interest; *e*, receipts of other sums, with particulars of the source of receipts.

“B. Private expenditure, excepting the portion for reinsuring—*a*, payment of compensations—(a) compensation not paid at the commencement of the year, (b) deaths occurring in the year, (c) survivorships exclusive of life annuities; *b*, life annuities paid; *c*, payment of premiums of reinsurance for old assurances, stating the amount of reassurances; *d*, payment for redeemed policies; *e*, payment of commission, brokerage, &c.; *f*, expenses of management; *g*, incidental disbursements, with general statement.

“4. Finally, that the Life Assurance Companies should furnish information annually on the following points, the better solution of which will be attained by the publication of a complete balance sheet—on the state of actual property, stating the investment of the capital, in furniture, mortgages, and effects.

“Persons remaining assured at the end of the year—into what classes may be divided the total amount of assurances remaining at the end of the year. (The above in groups of ages not exceeding five years each.)

“1. The object of the institution, the situation of the chief office, when established, and the different modes of assurances which it effects.

“2. The nature of the institution—*i.e.*, whether it is supported by shares or the mutual principle; whether it is based on the mixed system or is a private undertaking. In the matter of Companies with shares, the amount of capital in shares issued, amount paid up, and what part of that sum has already been sunk.

“3. The financial year, from — to —.

“4. The total sum assurances shown by the accounts of the Society itself, under the head of life assurances (excluding reassurances).

"5. That Life Assurance Offices should also give each year information on the following points (which would be best effected by the publication of complete balance sheets):—*a*, as regards the passive capital, stating the nominal capital, the reserve fund, the reserve premiums, and the reserve compensations; *b*, the profit gained in the course of the year and how employed, the losses incurred, and their liquidation."

B.—*Tontine Assurances.*

"With regard to Tontine Societies (*i. e.*, Offices for annuities and assurances for survivors), the following resolution is submitted:—

"Whereas the operations of Annuity Offices are dependent on calculations based upon previous observations of human life, and that Annuity Offices which take the deposit of capital require the calculations of life annuities; whereas also Assurance Offices for survivors, when they establish mutual assurances against the loss of capital which the death of members entails on their survivors, coming under the head of assurances; and whereas these, as well as Life Offices, are in a position to furnish important statistical materials; the section proposes to decide—

"I. That proposals made for life assurances, under I. A–C, shall also include annuities and assurances for survivors.

"II. That the application to Life Assurance Societies shall also be addressed to the Tontine Assurance Societies, and that the proposals under II. 3, shall be adopted in the following form:—

"1. The number of persons assured at the commencement of the financial year—with what capital or total income; distinct calculations for each Society.

"2. The number of persons insured during the year, with regard to the returns under I.

"3. The number of assurances terminated—*a*, by death; *b*, by expiration of the period accounted for; *c*, by other causes.

"4. The number of persons remaining assured at the end of the year, to which are to be added—*a*, the names of the Societies; *b*, the situation of the chief Office; *c*, the nature of the assurances effected; *d*, the year in which the returns were made.

"III. That the detailed statements of the condition and commercial progress of these institutions, together with the commercial results of each Society, be drawn up and published."

C.—*Fire Assurance.*

D.—*Transport Assurance (goods in transit).*

E.—*Hail Assurance.*

F.—*Cattle Assurance.*

The facts required under the last four heads, either from the Government or the Companies, are not so minute as under the two first heads, but the nature of them will be sufficiently indicated by the previous resolutions. If they could be fully obtained at regular intervals the most complete tableau would be afforded of the money progress and position of assurance in all its branches in every country.

The 6th section was entirely occupied with the question of the unity of weights and measures, as the most important auxiliary to the comparison of the statistics of different countries.

I must endeavour to explain, in a few words, how the subject came to be introduced at a Congress, at which it might at first sight appear to form only a minor question for consideration. The great discrepancy in the weights, measures and values, in different countries, has for many years rendered almost useless the elaborate tables which have from time to time been formed of the comparative statistics of different countries. Tables of population, provided they were classed under the same heads, might be easily compared; but, in the statistics of production, the tables gave weights, measures and values which were quite incomprehensible, till by a laborious process they had been converted into the equivalent weights, measures and values of the country with which it was desired to compare them. It naturally followed that at every meeting of the Statistical Congress a strong opinion was given against the present incongruities and diversities, and an ardent wish expressed that some uniform system might be adopted which would enable one country, in an international point of view, to acquaint itself easily with the productions, the resources, or the commercial capacities of any other with whom commerce was desired.

So strongly was this felt that, in the International Statistical Congress held in London in 1860, it was determined by the Committee of Organization to include this most important question in the programme, and I had the honour of being requested to write this part of the programme to be submitted for discussion.

With the view of eliciting some practical results from the discussion, there was proposed—

- 1st. The reduction of the Statistical Tables, published for international purposes, into the terms of the metric system, which, in fact, was no more than confirming what had been already proposed at the Congresses of Brussels and Paris, with the exception that it brought the question into a more definite shape, as the resolution to prepare International Statistical Tables had just been agreed to.
- 2nd. The adoption of the Metrical System by countries which had not yet accepted it.
- 3rd. A general inquiry into the existing Weights, Measures and Monies of different countries, whether local or customary; and

- 4th. The preparation of a Report for the next Congress of the actual systems in use, and on the best means of overcoming the obstacles that may exist in any country to the establishment of the Metric System.

These resolutions were debated in the section for two days, under the presidency of Mr. James Heywood, F.R.S., and a very animated discussion ensued. Both Englishmen and foreigners, well known for their intellectual pursuits, their devotion to the cause of social improvement or international intercourse, took part in the discussion. Sir John Bowring, late Her Majesty's Superintendent of Trade at Hong Kong; M. Visschers of Brussels, a distinguished orator on all social questions; Sir Charles Pasley; Professor Ackersdyk, of the Hague; Mr. James Yates, F.R.S., the founder of the International Decimal Association; Lord Montague; Mr. J. P. Smith, M.P., and others, took part in the discussion, and resolutions were carried, fully confirming those proposed with regard to weights and measures, but somewhat altering the recommendations as regarded coins. They were as follows:—

As regards weights and measures—

“1. That it be recommended that, in countries not using the metrical system, the column containing the reduction of all weights, measures and values to the terms of the metrical system, according to the resolution of the first International Statistical Congress, be added to the statistical tables which it shall be decided to be published as international tables.

“2. That the Government delegates from all countries in which the metrical system is not in use should be requested to urge upon their respective Governments the great advantages attending the adoption of the metrical system in weights and measures, and that all changes hereafter made should have in view the bringing of this system into general use.

“That each Government should be requested to institute an inquiry into the existing weights and measures, whether local, customary, or established by law, so that comparative tables may be formed, by reducing them all to the terms of the metrical system.

4. “That an International Commission be nominated, to whom the results of these inquiries may be submitted, for the purpose of preparing a report for the next Congress, on the actual systems in use, and on the best means of overcoming the obstacles that may exist in any country to the establishment of the metrical system in weights and measures.”

And as regards coins—

“1. The simplicity, convenience, and efficiency of the decimal system of money and accounts, recommend it for general adoption.

“2. The Congress recommend the adoption, as far as possible, of a common degree of fineness in gold and silver coins.

“3. The Congress also recommend that the Government delegates from all countries in which a decimal system of coinage has been adopted be requested to collect all facts showing whether any or what inconveniences

have resulted from such changes, and how such inconveniences, if found to have existed, have been met and remedied.

"4. That an International Commission be nominated, to whom the results of these inquiries may be submitted, for the purpose of preparing a report for the next Congress on the actual systems in use, and on the best means of overcoming the obstacles that may exist in any country to the establishment of the proposed changes."

The International Commission was then nominated, consisting of the following gentlemen:—

- England* . . . . . The Right Hon. Viscount Ebrington (now Earl Fortescue).  
The Right Honourable Lord Monteagle.  
J. B. Smith, Esq., M.P.  
Alderman Salomons, M.P.  
James Heywood, Esq., F.R.S.  
Thos. Graham, Esq., F.R.S., Master of the Mint.  
Charles Babbage, Esq., F.R.S.  
James Yates, Esq., F.R.S.  
Samuel Brown, Esq., F.S.S.  
Leone Levi, Esq., F.S.S., Barrister-at-Law.  
Theodore Rathbone, Esq.
- France* . . . . . M. A. Legoyt, Director of the General Statistical Department.  
M. Michel Chevalier, Councillor of State, Senator, Member of the Institute.
- Belgium* . . . . . His Excellency Silvain Van de Weyer, Belgian Minister.  
M. A. Visschers, Member of the Board of Mines and of of the Central Statistical Commission.
- Denmark* . . . . . Dr. C. N. David, State Councillor, Director of the Statistical Department.
- Italy* . . . . . Count Arrivabene, Milan.  
Signor Bartolomeo Cini, Florence.
- Norway* . . . . . Professor L. K. Daa.
- Prussia* . . . . . Dr. E. Engel, Privy Councillor, Director of the General Statistical Department.
- Netherlands* . . . . Dr. M. M. Baumhauer, Director of the Statistical Department.
- Oldenburg* . . . . . Herr O. Lasius, Finance Councillor.
- Russia* . . . . . Professor Kupffer, of the Imperial Academy of Sciences.
- Spain* . . . . . Count De Ripalda, Central Statistical Commission.
- Sweden* . . . . . Dr. F. Th. Berg, Director of the Federal Statistical Department.
- Switzerland* . . . . M. Vogt, Director of the Federal Statistical Department.
- United States* . . . Dr. Edward Jarvis, Dorchester, Massachusetts.  
J. H. Alexander, Esq., Washington.  
Samuel B. Ruggles, Esq., Washington.
- British Colonies* W. Westgarth, Esq., Victoria.  
J. T. Galt, Esq., Finance Minister, Canada.  
W. Field, Esq., Cape of Good Hope.  
James Macarthur, Esq., New South Wales.  
Sir Stuart A. Donaldson, 22, Rutland Gate, London.  
J. E. Fitzgerald, Esq., New Zealand.

To the original names were added, at Berlin, Mr. Samuel Ruggles, Delegate from the United States to the Berlin Congress, and Dr. Lasius of Oldenburg, who took a warm interest in the discussion in the Congress.

Professor Leone Levi, so well known as the eloquent and talented Lecturer on Commercial Law, and myself, had the honour of being appointed at the time Joint Secretaries of the Commission.

As so many of the members of the Commission were resident in foreign countries, we had no means of direct communication with them till the meeting of the Congress at Berlin, but in the meantime obtained from them some valuable reports, especially from Baron von Czoernig in Austria, Count de Ripalda in Spain, and Professor Daa in Norway, of the progress of the metrical system in their respective countries.

When the International Statistical Congress was called in Berlin, the International Decimal Association urged upon the Organization Committee the great importance that the report to be presented should form the basis of a discussion in a Congress where so many enlightened and influential men were likely to be gathered, especially from the smaller states of Germany, where already the question had been seriously considered at Frankfort.

In the able report of Dr. Engel, a full description of what had hitherto been effected was given, and a strong recommendation to include this question amongst the subjects to be debated. The consequence was that a whole section was set apart for the discussion, though the propositions fell very far short of those embodied in the report, as will be afterwards seen.

From the difficulty of collecting opinions from the representatives of so many different countries, the secretaries prepared the sketch of a report, and, on arriving at Berlin, called together such members of the Commission as were present at the Congress—Mr. James Heywood, F.R.S., presided, and amongst the members present at the Congress were M. Legoyt from France, M. Visschers from Belgium, Dr. David from Denmark, Dr. Engel of Prussia, Dr. Baumhauer from the Netherlands, Professor Kupffer from Russia, Count de Ripalda from Spain, Dr. Berg from Sweden, and others.

The report comprised a general statement of the existing systems of weights and measures in different countries, and of the progress which had been made towards a uniform system. The United Kingdom, France, Belgium, Holland, Switzerland, Spain, Portugal, Greece, Italy, Germany, Russia, Sweden, Norway and Denmark, Turkey, China, Japan, Persia, India, the United States of America,

Mexico, the Free States of South America, Jamaica, Canada, Brazil, Mauritius, Chili, British Guiana, Guinea, West and North Africa, West Indies, for all these countries a brief summary is given of the diverse systems of weights, measures and monies which prevail. Yet, even in the most remote of these countries, the decimal system is found in force, and the conclusion is summed up in the report as follows:—

“We are, therefore, justified in reporting, that the great majority of nations have found it necessary and useful to adopt a unit of length equivalent to the metre. Much has been said on the comparative merits of the metre and the foot as a unit of length. In a vast variety of trades, the foot is universally used, but for as many other objects the yard or metre is general. Dr. Karmarsh, in his evidence before the Committee of the House of Commons, said, that the metre is a length much more commodious for use than the foot. And as an evidence that the foot is too small, he showed that when we measure some length we do not make use of a single foot rule, but of a rule which is 3 or 4 feet, and we have to multiply by 3 or 4 to reduce it into feet. In the measure of cloth the metre or yard is generally used. The builders in Germany make use of the ell instead of the foot, because the foot is too small. In Saxony the builders measure all objects by the ell of 2 feet. In Austria they have the klafter of 6 feet. Again, the subdivision of the metre is much more commodious for use than that of the foot. In the foot we have 12 inches; the inch is too large. In measuring many things we must join to the inch some fractions of an inch, but by making use of the metre we have the centimetre, which is so small that we scarcely want fractions of it, and for smaller things we have the millimetre, which is much smaller than the line, or the eighth of an inch.

“As respects the subdivision of the units, we find that—

“France, Belgium, Holland, Switzerland, Spain, Portugal, Greece, Italy, Sweden, China, Japan, India, Chili, have a decimal division; and

“The United Kingdom, United States, Germany, Russia, Norway, Denmark, have a duodecimal division, though in some of them the weight is decimally divided.

“With such facts before us, we cannot help concluding that the introduction of the metric decimal system appears to be the most consonant with the habits and tendencies of the commercial world; and that, therefore, in endeavouring to introduce uniformity in the weights and measures of all countries, we cannot do better than accept that system which has already made so rapid progress, and which possesses most if not all the requisites which are necessary for purposes of commerce, social intercourse, and scientific computations. It appears, moreover, from the practice of most countries, that, so long as the use of the metric system was allowed to be voluntary or optional only, the measure never made much progress, the people preferring to use the old systems, whatever their merits or defects, and that therefore the success of the measure depends on its compulsory character.

“And, lastly, that although in most countries metric weights and measures have been introduced with their Greek and Latin nomenclature, several countries have adopted their own idiomatic names, whilst in France and other countries, the old names, though illegal, are still freely applied to the new quantities.

"This Commission is strongly of opinion, that in whatever country the metre is introduced, care should be taken not to encumber it with any other subdivisions than its decimals.

"In conclusion, the Commission would recommend the Congress to resolve:—

- "1. The adoption of the same measure in international commerce is of the highest importance. The metrical system appears to the section to be the most convenient of all the measures that could be recommended for international measures.
- "2. The arrangements and rules to be followed in the construction of the standards, and in the introduction of this system, should be confided to an International Commission, which should also be charged with the duty of ascertaining the means of correcting the slight defects in the original standards.
- "3. That it is desirable that the introduction of the metrical system into any country which accepts it, should be made compulsory in the shortest practicable period.
- "4. That each Government should institute a Department of Weights and Measures to superintend the introduction of the metrical system, and to carry out its details, or to devolve the duty on some one of the existing departments."

These resolutions, as finally carried by the Commission, were more definite than those proposed in the original draft of report, and, it is satisfactory to find, not only that they contend for the universal introduction of the metrical system as to weights and measures, and suggest practical means of carrying it into effect, but that thus enlarged they were, after two days' discussion, unanimously carried in a meeting including the representatives of so many different nations, and recommended to be passed by the Congress.

The more difficult question of international coins was also fully treated in the report. I ventured to suggest a proposition which I had already made to the Statistical Congress in London. Admitting the difficulty of inducing all nations to adopt a single unit for money, they might yet agree to reduce the great number of existing units to three or four, and that these by such slight alterations in the weight, as might be necessary, should be to each other in definite proportion of pure metal, silver or gold. The effect would be that they might be easily made current and interchangeable by law in each country for their equivalent values. If all the subdivisions of the unit were decimal, a simple multiplication or division by a single figure and the proper placing of the decimal point would enable values of any amount in one country to be converted into the equivalent values in another country, with almost as much facility as if a single unit were every where prevalent. It



requires only, in addition to these changes, that all coins should be of the same degree of fineness, and resolutions to this effect had been already passed in preceding Congresses. Mr. Graham, the Master of the mint of the United Kingdom, has expressed his opinion that no practical difficulty would be experienced in carrying out this proposition universally. The greatest difficulty would be the difference in the value of gold and silver, as the use of a gold standard by some countries and of a silver standard by other countries would require some means of constantly adjusting the relative values. This difficulty, however, would not be felt between countries using the same standard. After much discussion in the Commission the original proposition was somewhat modified.

The conclusions of the Commission on this part of the subject are thus stated in the report :—

“ Admitting that, to suit the customs or convenience of different nations, more than one unit of money is desirable, we may yet agree to restrict them to a very small number, and that these should be convertible, by a simple calculation, from one into the other. Thus, the franc, the florin, the dollar, and the £ sterling, might be allowed as units, the coins to be in all cases nine-tenths fine, and decimally subdivided, and the weight of pure metal to be the equivalent weights in the metric system. By multiplication or division by a single figure, and the proper placing of the decimal point, values to any amount in one of these monetary systems might then be reduced to the equivalent values in any other of them, as shown in the following comparison:—

Coins.	Weight.	Weight of pure Metal.	EQUIVALENT VALUE.			
			£1 sterling.	1 Dollar.	1 Florin.	1 Franc.
			Multiplied by			
Franc . . . . .	Grammes. 5	Grammes. 4·5	·04	·2	·4	—
Florin . . . . .	12·5	11·25	·1	·5	—	$\frac{1}{2}$
Dollar . . . . .	25	22·5	·2	—	2	5
£ sterling . }	(in gold, to be adjusted) }	{ . .	—	5	10	$\frac{1}{4}$

“ By this means the various countries would have such a choice of a money unit as might be found most convenient for general use, or the habits of the people, and yet the greatest facility would be given in commercial calculations, and in providing a system of coins interchangeable in different countries.

“ We have good authority for supposing that the English sovereign, now so extensively used as money of account, is likely to be greatly displaced by a coin which has always been popular. The dollar, so much used in Eastern commerce, is about to be coined in the mint of Hong Hong, and will, it is reasonable to suppose, be the principal current coin, as well as money of account, in the extensive trade with China. No doubt it will thence be largely used in the Indian commerce, so closely connected with

that of China. To what extent it may eventually displace the English £ sterling, especially if an equivalent gold coin be introduced into this country, it is difficult to say; but from the numerous countries in which the dollar, or a coin nearly equal to the five franc piece of France, has been the leading coin, it is likely to assume a very important position. It therefore becomes of the utmost consequence to inquire if this new coin, and others bearing the same name and nearly equivalent value, could not be, in all cases, made of the same weight in silver as the five franc piece of France, viz., 25 grammes of nine-tenths fine and one-tenth alloy.

"The selection of the unit, and the best means of introducing the new proposed coins, and making them current for their equivalent values in different countries, together with the very important questions whether gold or silver should be the standard, and the relative value of the precious metals silver and gold, could only be settled by agreement in a convention of delegates, such as Masters of the Mint, or other parties skilled in these subjects, who should be appointed by the various Governments to discuss and decide on the points in debate.

"Some influential attempts have already been made to bring about the desired uniformity between two or more countries, but not on the enlarged scale which the subject requires, nor with the authority to which the different Governments would be disposed to submit. In 1857 the monetary convention was made between the German States of the Zollverein, when they decided upon fixing the exact value of the Prussian, Rhenish, and Austrian coinage, and in coining the Verein thaler to have the same currency as the national coins of each State. In 1858 the Senate and House of Representatives of the United States of America passed a resolution desiring the Secretary of the Treasury to appoint some Commissioner to confer with the proper functionaries in Great Britain, in relation to some plan or plans of so mutually arranging on the decimal basis the coinage of the two countries as that the respective units shall be thereafter easily and exactly commensurable, and Professor Alexander was appointed for that purpose. The United Kingdom is on the eve of changing or considerably reforming the entire system of weights, measures, and coins, and any change made by the Home Government would necessitate a corresponding change in all her vast colonies and dependencies. The greater part of Europe has already a common system, and Russia and the Northern Scandinavian powers have manifested their entire willingness to co-operate with other countries.

"In conclusion, as far as regards money, we beg to submit the following propositions for discussion or adoption by the Congress:—

- "1. That the Congress recommends that the existing units of money be reduced to a small number; that each unit should be decimally subdivided; and that the coins in use should all be expressed in weights of the metric system, and should all be of the same degree of fineness—namely,  $\frac{9}{10}$ ths fine and  $\frac{1}{10}$ th alloy—and should be current by law, and interchangeable in all the countries agreeing to this proposition.
- "2. That from their extensive use in commerce and monetary transactions, the £ sterling, the dollar, the florin, and the franc seem the units the most desirable to be recommended for universal adoption, each country not possessing one of these in actual use selecting the one most convenient for its own use.

- "3. That in regard to the silver standard, the dollar be made equal to 5 francs, and the florin to  $2\frac{1}{2}$  francs, and the franc as at present being 5 grams in weight, and containing 4.5 grams of pure silver.
- "4. That the different Governments be invited to send to a special Congress delegates authorized to consider and report what should be, in the metric system, the relative weights of the gold and the silver coins, and to arrange the details by which the monetary system of different countries may be fixed, and the coins made current and interchangeable according to the terms of the preceding propositions."

The report having been agreed to it was ordered to be presented to the Congress, since it was from the preceding Congress that the Commission had emanated. The 6th section, which had been named by the Committee of Organization, had not the report before them for discussion, but merely two resolutions in the programme, well introduced by Professor Dr. Magnus, which recommended the general adoption of the metrical system, with some slight corrections of the defects in the method of constructing the standards.

But it was very desirable that the section should, as far as possible, support the proposition of the Commission, and resolutions were accordingly proposed which led to a very animated discussion, continued over two days. The four resolutions of the Commission as to weights and measures were eventually carried, and to these was added one proposed by Mr. Heywood, still further suggesting the practical means of carrying out the metrical system :—

"5. That in all cases where the Government of a country consents to the introduction of the metrical system of weights and measures, as a permissive arrangement, it be recommended that the metrical system should be introduced into the business of Custom Houses, and that the Inspectors of Schools should be requested to encourage the study of that system in the schools subject to their inspection."

The question of international money, however, presented greater difficulties. It formed no part of the original programme, but was only included in the report of the Commission, and in the resolutions submitted by them to the Congress. Dr. Lasius of Oldenburg supported to a great extent these propositions, but they were opposed by Professor Dove and others. The great obstacle to interchangeable coins seemed to be the double standard of gold and silver, and what appeared to the section the almost impossibility of finding the means of adjusting from time to time the relative values for which the coins of each metal, though equivalent in weight, could be exchanged. M. Kierulf of Norway, who had taken a principal share in the important meeting recently held at

Gottenburg, at which the metric system of weights, measures and coins was recommended for all the Scandinavian kingdoms, threw out an excellent suggestion, that the different countries might be divided into two classes, those using a gold standard and those using a silver standard. The former might have their gold coins interchangeable by weight of pure metal amongst each other, and the latter their silver coins in like manner amongst each other. It is well worthy of consideration until some method could be found of meeting the difficulty more completely. Mr. Ruggles, a delegate from the United States, expressed his opinion that they were quite prepared to make any change which would bring them in these matters into relation with the countries of Europe, admitting the vast increase of commerce which might be expected by the facilities now proposed. This gentleman, it may be mentioned, suggested in the Congress the great importance of appointing a committee to ascertain the actual proportions of gold and silver now existing in the world, since the vast gold discoveries have so altered the relative estimates.

The time had evidently not come for pressing upon this meeting the question of international current coinage. The second and third resolutions of the Commission were not carried, and the first and fourth altered so as to be consonant with the change agreed to. But an additional resolution was proposed, and unanimously carried, with the view of bringing early and practical results from these deliberations. The resolutions, as finally carried in the section, were as follows:—

“1. That the Congress recommends that the existing units of money be reduced to a small number; that each unit should be, as far as possible, decimally subdivided; and that the coins in use should all be expressed in weights of the metric system, and should all be of the same degree of fineness—namely, nine-tenths fine and one-tenth alloy.

“2. That the different Governments be invited to send to a special Congress delegates authorised to consider and report what should be the relative weights, in the metrical system, of the gold and silver coins, and to arrange the details by which the monetary system of different countries may be fixed, according to the terms of the preceding propositions.

“3. That it being of the greatest importance that the different Governments should appoint the proposed Commission as soon as possible, this section recommends the Congress to make a special communication of the above resolutions to the different Governments.”

The reporters to the Congress were—Professor Dove in German, and M. Rendu in French; and the Marquis d'Avila of Portugal, Professor Leone Levi, and Mr. Ruggles from America, took part in the debate. All the resolutions were finally confirmed, whilst the

report of the Commission, which goes even still further, was received without alteration, and will, it is understood, be printed entire in the official report of the proceedings of the Congress.

On the whole, we cannot but come to the conclusion that the final result is highly in favour of the extension of the metrical system, and of its universal adoption by all countries. At every Congress, and every important meeting where enlightened men from all countries have been gathered together, to discuss questions of common interest for all nations, the necessity, in the interests of commerce and of international intercourse, for some common system of weights, measures and money, has forced itself upon their attention. The metric system presents so many claims that no other has ever stood ground against it as an international system, however popular some may have been amongst those who desire to keep or improve systems which are purely national.

Beginning with the Great Exhibition of 1851, and the memorial of the Society of Arts, we have resolutions passed in its favour at the International Statistical Congress at Brussels in 1853, at Paris in 1855, at Vienna in 1857, at London in 1860, at Berlin in 1863.

It has already been established, in whole or in part, in the principal states of Europe, numbering more than 120,000,000 of people in France, Belgium, Switzerland, Spain, Portugal, in the Zollverein of Germany, &c., nor is there any desire to change where it has been once introduced.

It is recommended by its wonderful simplicity, the facility with which in can be learnt, the saving of time spent in education, its universal application, as being founded on a measure of the earth's surface, its decimal subdivisions, and the consequent ease with which the most elaborate calculations may be made, and by the readiness, as was proved by the evidence taken before Mr. Ewart's committee, with which the ordinary workman can learn it and apply it to practice.

The International Decimal Association, which was established after the Great Exhibition in Paris, has, after much discussion, adopted the metre as the best of all measures to be recommended for universal adoption in all countries, and has since for weights and measures urged the metric system in its entirety. To this Association is mainly due the great interest excited on this subject at the meetings of Social Science, amongst Chambers of Commerce, Mechanics' Institutions, &c.; and, in a great measure, to its constant exertions is owing Mr. Ewart's recent Committee of the House of Commons. The evidence taken by this Committee is most valuable and interesting, comprising that of all classes of

witnesses, both foreign and English, and the debate in the House of Commons on Mr. Ewart's bill will be found to contain all the points of the question, argued with the greatest eloquence and ability.

If some such measure as he proposes should eventually be carried, we cannot but believe that a still further impetus would be given to the vastly expanding commerce of the country, uniting all nations in bonds of mutual interest, and carrying, as free international commerce always does, the blessings of civilization, order and peace throughout the world.

I have thus endeavoured to compress, within a small compass, a brief summary of the vast variety of questions submitted to the Berlin Statistical Congress. They never could have been disposed of satisfactorily but for the subdivision into sections, which enabled practical men of different countries, taking an interest in one particular subject, to bring all their experience to bear upon its elucidation. Another great element in the success of the Congress was the very admirable "*avant projet*," written by Dr. Engel, the Director of the Royal Statistical Bureau of Prussia, whose work in itself, a history of what had been already treated of in each previous Congress, and full of suggestive matter for the future, formed the basis of the programme, each part of which was written by some author eminent in the question referred to him.

Besides his indefatigable labours, which under peculiar circumstances were unusually great in preparing for the Congress, to Dr. Engel, under Count Eulenburg's suggestion, we are also indebted for a most admirable work, being an index or summary, under classified heads, of all the subjects discussed, the resolutions passed or propositions reserved, at each of the four preceding Congresses, a work much wanted as a guide in such a labyrinth of statistical riches, and which has been executed with the greatest ability, precision and clearness. It includes, as may be supposed, from being a summary of the history of four such Congresses as the one I have now endeavoured to describe, notices upon almost every question that can affect either the efficiency of a good Government or the well-being of the people.

It would be unjust to conclude without a gratifying allusion to the honours paid by the Prussian Government, and the munificent hospitalities, official, public and private, shown to the members of the Congress. Besides the reception by the King, and a representation at the opera house (at which His Majesty and the Royal Family were present) given by the King to the members of the

Congress, they were invited to a sumptuous entertainment at Potsdam by their Royal Highnesses the Crown Prince and Princess, and to a magnificent supper given by some members of the municipality of Berlin, though styling themselves modestly only a few friends of statistics. His Excellency the Prime Minister, Von Bismark, and His Excellency Count Eulenbourg, Minister of the Interior, invited the official members to dinners at their private residences; and to the courtesy and unvarying attention of Dr. Engel, and other Prussian authorities and private friends, is owing a debt of grateful remembrance not easy to be repaid nor soon to be forgotten.

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*Cotton-Spinning Problem.\** By W. S. B. WOOLHOUSE, F.R.A.S.

SOME years ago, before the enactment of the Ten Hours Factory Bill, I had the honour to be engaged by the Earl of Shaftesbury (then Lord Ashley) on an investigation of the average distances traversed daily by children and others employed as "piecers" in the cotton mills about Manchester and the surrounding districts. After taking the various dimensions of the mules or spinning-jennies, and making the requisite observations as to the number of strokes of each machine per minute, and the average number of breakages of the threads at each stroke, I found that the necessary calculation involved a preliminary discussion of a somewhat curious mathematical problem.

As the subject, in its peculiar connexion with the theory of probabilities, is both novel and interesting, it has been suggested to me that it might be acceptable to give a mathematical enunciation of the problem, with a sketch of the method of solution I then adopted. The resulting formula is elegant, and easy of calculation, and its practical application to the important inquiry then under consideration showed that in many cases the distances travelled exceeded thirty miles per day, a task that must have been rendered additionally irksome and fatiguing by the continual stooping posture.

To comprehend the subject in a mathematical point of view, the problem presented for investigation may be stated as follows:—

PROBLEM.—Supposing  $n$  points to be taken promiscuously on a line of a given length, and that a person stationed somewhere on the line is required to proceed to all the points by the shortest route, determine the average distance that he may be expected to travel.

\* As the production of an eminent actuary, this curious and interesting problem will, no doubt, be acceptable to our readers.—ED. A. M.